United States Patent

Reuber

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[45] **Oct. 24, 1972**

[54] **GROUND WHEEL DRIVEN OSCILLATING HARROW**

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[21] Appl. No.: **61,997**

[52] **U.S. Cl.** **172/105,** 172/110, 172/117, 172/456

[51] **Int. Cl.** **A01b 39/10**

[58] **Field of Search**.....172/48, 50–51, 172/53–54, 59, 97, 101–102, 110–111, 117, 311, 105, 456

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[57] **ABSTRACT**

An agricultural implement in which spaced apart, concentric rings carry depending harrow points, the rings being subjected to oscillatory movement during operation by a pitman crank and sway bar actuated responsive to movement of the implement. The rings are adapted to folding to transport positions, and are also elevated for transport.

1 Claim, 11 Drawing Figures

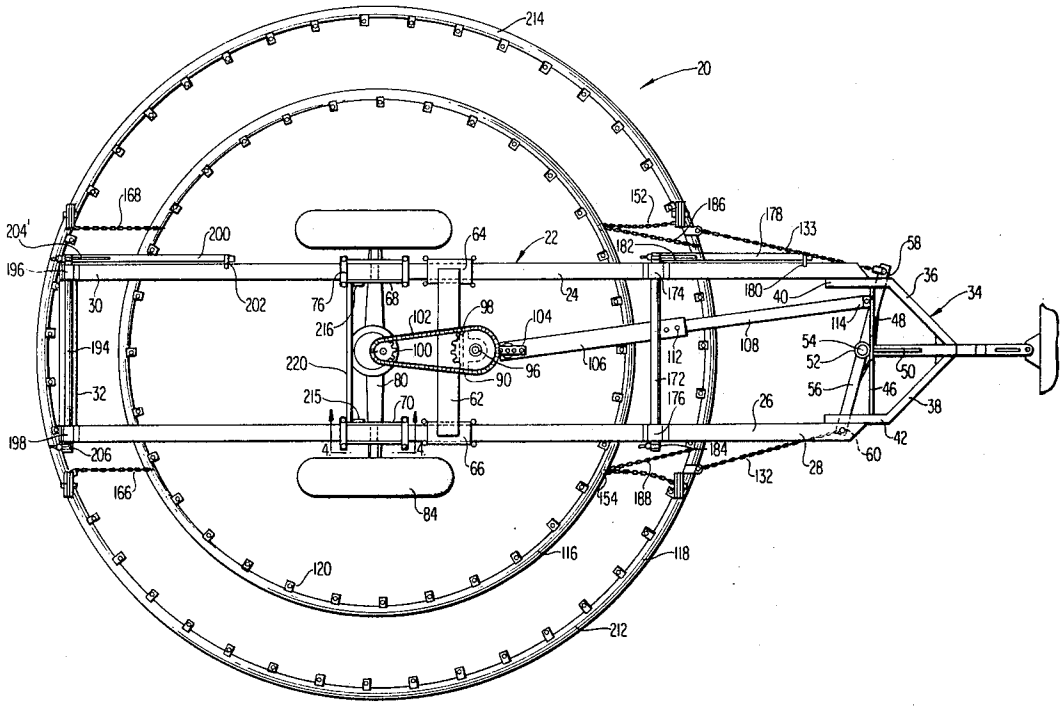
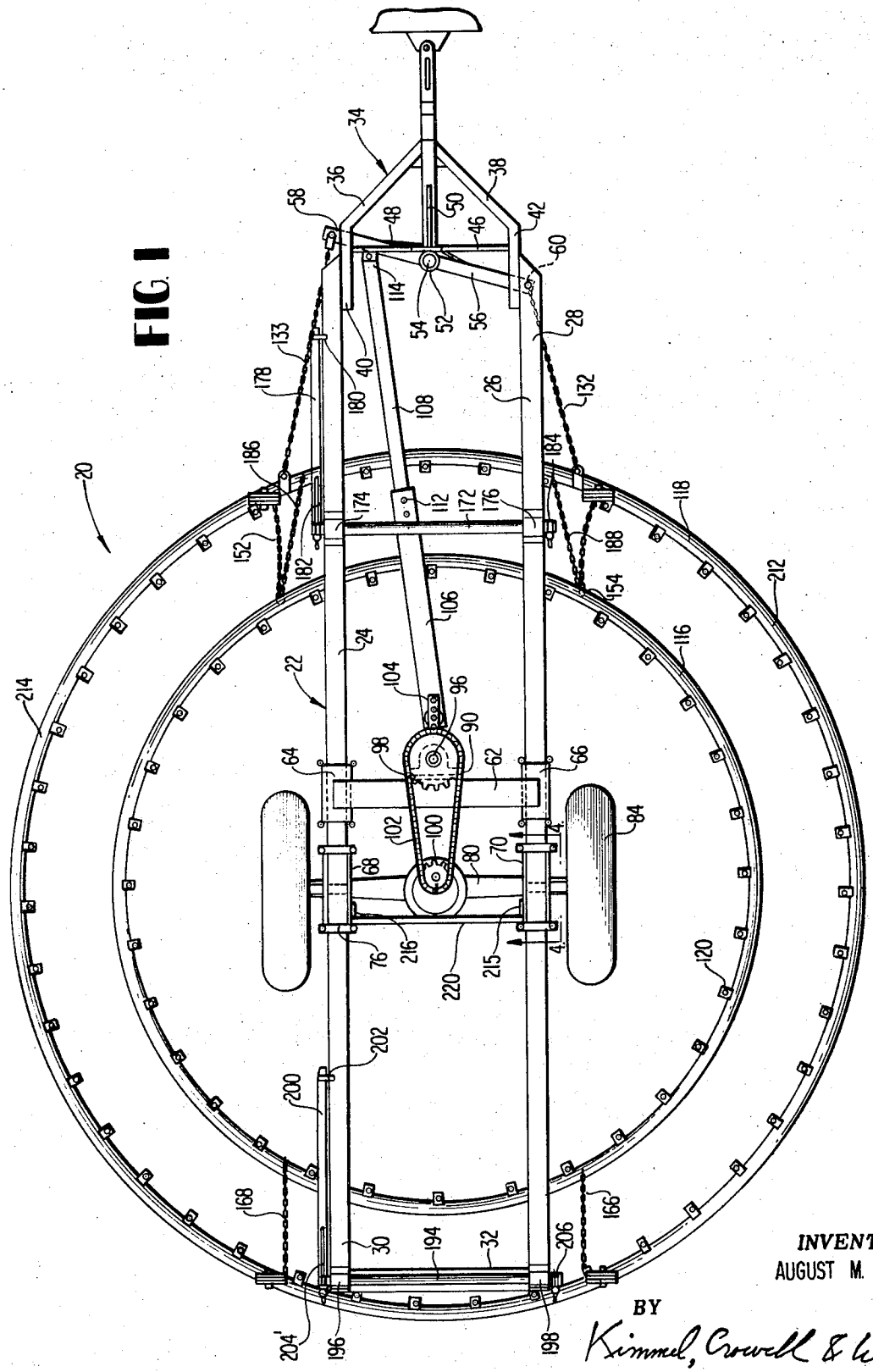


FIG. 1



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SHEET 2 OF 3

FIG. 2

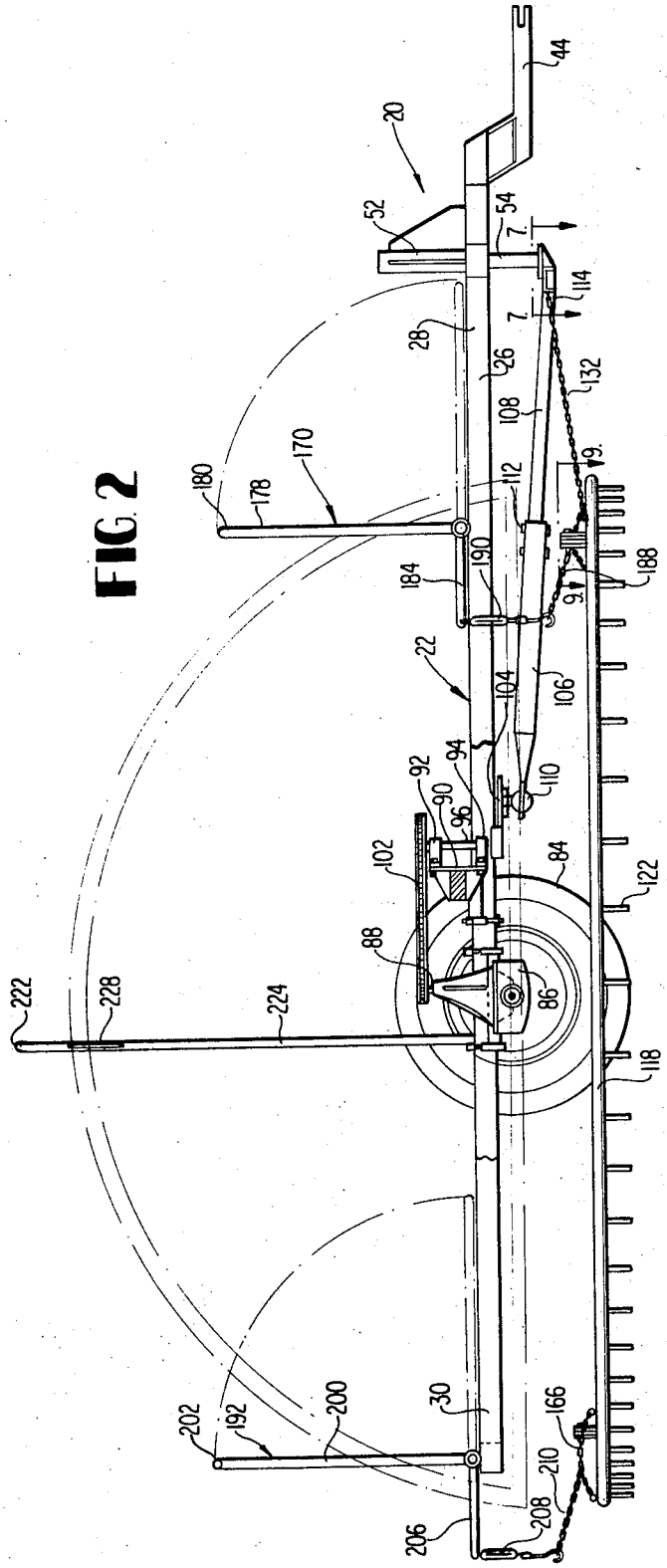


FIG. 11

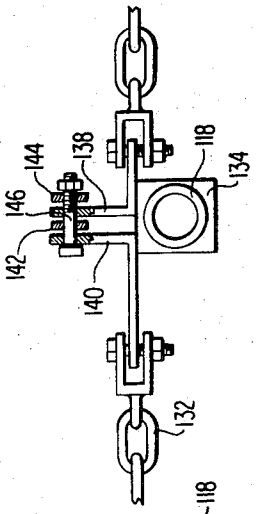


FIG. 10

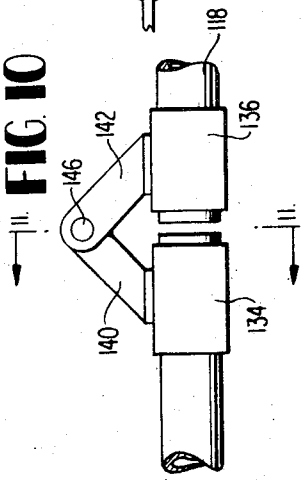
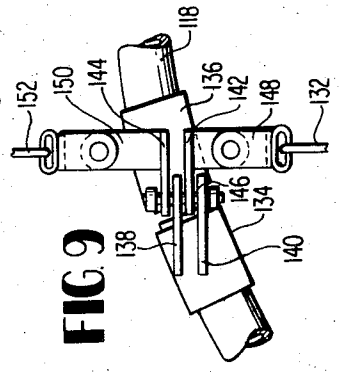


FIG. 9



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FIG. 3

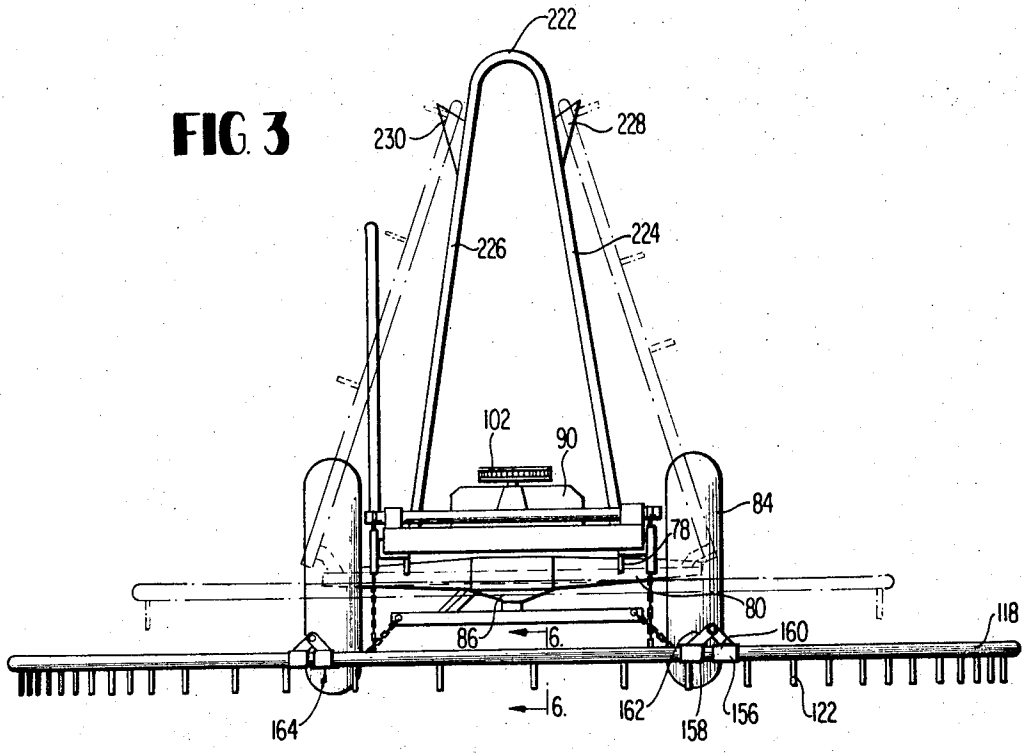


FIG. 4

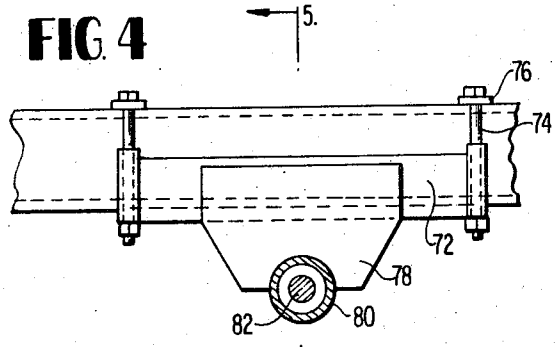
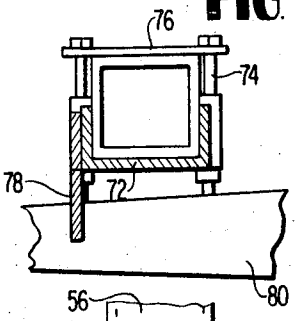


FIG. 5



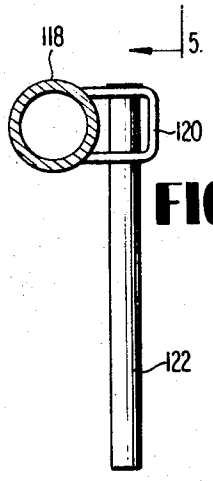


FIG. 6

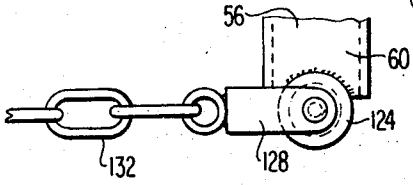


FIG. 7

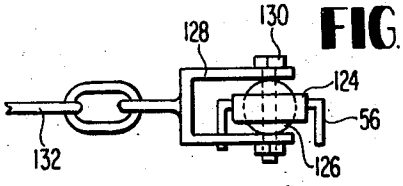


FIG. 8

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GROUND WHEEL DRIVEN OSCILLATING HARROW

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to a harrow of the type adapted to soil levelling and to stubble crushing, and to general harrow functions of cultivation, soil smoothing and pulverizing.

2. Statement of the Prior Art

It has heretofore been known to provide harrow assemblies in which concentric rings carrying depending teeth are oscillated in rotary fashion during a pulling procedure. Prior U.S. Pat. No. 3,066,744 shows a successful device of that nature.

SUMMARY OF THE INVENTION

The present invention relates to improved means for imparting rotary oscillatory movement to concentric harrow rings, and to means for effectively and conveniently transporting the assembly from place to place. The invention provides a gear or sprocket drive, the rotation of which is corelated to the support wheels for the harrow whereby the oscillation of the rings is a function of the speed of movement of the harrow. The unit is provided with interchangeable gears, and thus, consistency of the rate of oscillation is achieved by a gear change if soil conditions specify faster or slower movement of the implement.

A feature of substantial importance in the invention concerns its ability to pulverize stubble remaining in grain fields after harvest. In the past, it has been necessary to destroy this stubble by burning prior to reculitivation, thus materially adding to air pollution in agricultural areas. Such pollution is presently to be banned by law in many areas. The present invention obviates that problem of pollution by eliminating the need for burning of the stubble.

Among the additional advantages of the invention are its self-cleaning features, the durability of its construction, and the fact that it calls for very little service or maintenance.

Other and further objects and advantages of the invention will become apparent to those skilled in the art from a consideration of the following specification when read in conjunction with the annexed drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a top plan view of a harrow constructed and assembled in accordance with the teachings of this invention;

FIG. 2 is a side elevational view of the harrow showing in phantom lines the manner for elevating and folding of the harrow rings;

FIG. 3 is a rear elevational view of the apparatus;

FIG. 4 is an enlarged, detail sectional view taken substantially on the plane of line 4—4 of FIG. 1, looking in the direction of the arrows;

FIG. 5 is a sectional view on line 5—5 of FIG. 4, looking in the direction of the arrows;

FIG. 6 is an enlarged sectional view taken on line 6—6 of FIG. 3, looking in the direction of the arrows;

FIG. 7 is an enlarged view of a chain connection means with the sway bar on the approximate plane of line 7—7 of FIG. 2, looking in the direction of the arrows;

FIG. 8 is a side elevational view of the connection shown in FIG. 7;

FIG. 9 is an enlarged detail view on line 9—9 of FIG. 2, looking in the direction of the arrows;

FIG. 10 shows the hinge connection of FIG. 9 from the side; and

FIG. 11 is a sectional view on line 11—11 of FIG. 10, looking in the direction of the arrows.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawing in more detail, a harrow representative of the concepts of the present invention is therein identified by reference numeral **20**. The harrow includes a main frame **22** of elongated form having a pair of laterally spaced side frame members **24** and **26**. The frame has a forward end section **28** and a trailing end section **30**, and the side frame members are spanned by a rear end frame member **32**, and are connected at the forward end of the frame by a draft yoke **34**. The yoke **34** includes angle members **36** and **38**, with side members **40** and **42** fixed to the side frame members, and a forward draw bar **44** secured in use of the device to a prime mover. The yoke further includes upstanding angle plates **46**, **48** and **50** which stabilize a vertical sleeve **52**. Projecting from the sleeve **52** in the direction of the ground is a shaft **54**.

Fixed on the lower end of the shaft **54** is a transverse sway bar **56**. The bar has opposite ends **58** and **60** and comprises an important structural feature of the invention as appears below in more detail.

Mounted intermediate the ends of the side frame members is a transverse cross brace **62**. The brace spans the side frame members, and is secured adjustably thereto on end saddles **64** and **66**. Also mounted on saddles **68** and **70** secured to the side frames **24** and **26** is an axle mounting means. Each of the last named saddles includes a box member **72** embracing the respective side frame members, and having bolt assemblies **74** with top clamps **76** to adjustably hold the box member in place. In FIGS. **4** and **5**, it will be observed that the plate **78** depends from the box, and is fixedly engaged to an axle housing **80**. Disposed within the housings **80** are axles **82** conventionally secured to outboard ground wheels **84**.

A differential gear housing **86** is located between the sections **80** of the axle housings, and has a gear system (not shown) of the usual type. Projecting from the housing is a vertical shaft **88**. Referring again to the cross brace **62**, a plate **90** is mounted thereon and has outwardly projecting bearing clamps **92** and **94**. Disposed in the bearing clamps is a vertical drive shaft **96**. The shaft **88** and the drive shaft **96** are longitudinally aligned, and the drive shaft has a first horizontally mounted gear or sprocket **98** thereon. The shaft **88** carries a second sprocket **100**, of reduced diameter relative to the first sprocket, and a roller chain **102** is trained about the sprockets. It is an important feature of the invention that the sprockets be changeable, whereby the speed of movement of the chain may be adjusted where desirable.

Projecting outwardly from the drive shaft at its lower extremity is an arm **104** having a plurality of openings formed therein and comprising a crank means. An elongated pitman arm **106**, having a telescoping section **108**, is secured, at a ball joint connection **110**, to a

selected position on the arm. The length of the pitman is variable by reason of the telescoping construction, and bolt means **112** is employed to lock the pitman at the desired length. The opposite end **114** of the pitman is pivotally secured to the sway bar **56** at an off-center location. The arm **104**, pitman **106** and sway bar **56** form a crank assembly, alternate pivoting motion being imparted to the sway bar upon rotation of the drive shaft **96** responsive to movement of the apparatus.

The harrow further comprises a plurality of concentric harrow rings, including in this illustrated form of the invention, an inner ring **116** and an outer ring **118**. As shown in FIG. **6**, the rings are of tubular construction, and have U-form brackets **120** at spaced intervals. The brackets have harrow teeth **122** fixed therein. The rings are secured to the main frame by flexible means, such as the chain means hereinafter described. Referring to FIGS. **2**, **7** and **8**, the sway bar **56**, at its ends **58** and **60**, is provided with annular connectors **124** having a central pivot ball **126** with a pivotal clevis **128** secured thereto by a changeable fastener **130**. Link chains **132**, **133** extend from the clevises to their respective connections with the outer ring **118** as shown in FIGS. **9** through **11**. In the latter figures, it will be noted that the outer ring is provided with hinge mechanisms adjacent the chain connection locations, comprising adjacent sleeve blocks **134**, **136**, each having upstanding hinge arms. The hinge arms of the block **134** are designated at **138**, **140**, while those on the block **136** are designated **142**, **144**. The arms have coaligned openings formed in their ends, and a hinge pin **146** extends therethrough. Side plates **148** and **150** extend laterally from the arms **142** and **144**, the plates **148** being connected to the chains **132** and **133**, respectively. A chain **152** extends to a suitable connector on the inner ring **116**, as at **154**.

Both the forward and rear end portions of the frame are provided with lever means for lifting the harrow rings for transport. The outer ring **118**, as shown in FIG. **3**, has rear connector blocks **156**, **158**, with hinge arms **160** and **162**, similar to the arrangement at the forward end and duplicated, at **164**, at the opposite side, the forward and rear connector blocks being longitudinally aligned in pairs, and defining foldable side segments of the outer ring **118**. The inner and outer rings **116** and **118** are connected at their trailing portions inboard of the foldable segments by chains **166**, **168**. The lever means comprise a forward lever assembly **170** having a cross bar **172** mounted in bearings **174**, **176** on the side frames **24** and **26**, with a longitudinal stop member **178** at one side thereof. The stop member has an inward lug **180** which contacts the frame member **24** when the lever is in elevated position. Lever arms **182**, **184** are fixed to the bar **172** and are connected to chains **186**, **188** by connectors such as turnbuckles **190**. The chains **186** and **188** are in turn connected to the chains **152** linking the inner and outer rings inboard of the foldable segments. Similarly, the rear lever assembly **192** includes a cross bar **194** mounted in bearings **196**, **198**, a stop member **200** with a lug **202**, and lever arms **204**, **206**. As shown in FIG. **2**, the lever arms are connected, as by turnbuckles **208**, to chains **210** secured to the respective linking chains **166** and **168**. Thus by actuation of the levers to the positions wherein the lugs **180** and **202** contact the side frame **24**, the rings are elevated to a transport position in which the teeth **122** are spaced from contact with the ground.

As indicated above, the ring **118** includes foldable outer segments, identified for reference herein by numerals **212** and **214**. Mounted on the frame at **215**, **216** is a rack **220** of inverted U-form having an apex **222** and sides **224**, **226**. Cleats **228**, **230** are provided, and when the foldable segments **212** and **214** are placed in the substantially vertical transport positions shown in phantom lines in FIG. **3**, the cleats aid in maintaining the same in position.

The operation of the apparatus involves towing by a suitable prime mover causing the area to be cultivated. Assuming the harrow rings to be lowered to a ground contact position, towing across the area actuates the differential gears within the housing **86**, rotating the shaft **88** and driving the sprocket **100** and chain **102**. This results in rotation of the sprocket **98** and drive shaft **96** with consequent crank arm movement of the arm **104** resulting in reciprocating actuation of the pitman **106**. This motion is imparted to the sway bar **56** which exerts alternate force on the chains **132**, **133**, causing oscillating motion of a rotary character to be imparted to the inner and outer rings.

I claim:

1. A harrow comprising:

an elongated main frame having spaced apart side frame members and transverse frame members;

the main frame having a forward end section with a tow yoke spanning the side frame members, and having a trailing end section;

a harrow assembly including a plurality of concentric rings each having a series of depending harrow points secured thereto;

an axle assembly, comprising an axle transverse to the side frame members, ground wheels, and a differential gear assembly, the axle assembly supporting the main frame intermediate said forward and trailing end sections;

a cross brace spanning the side frame members forward of the axle assembly, and carrying a vertical drive shaft with a first horizontally mounted sprocket;

a second vertical shaft projecting from the differential gear assembly and having a second horizontally mounted sprocket therein spaced from the first sprocket, the second sprocket being of reduced diameter relative to the first sprocket;

a drive chain trained about the first and second sprockets and driven by the differential gear assembly responsive to movement of the harrow;

an arm extending outwardly from the vertical drive shaft;

a pitman, having opposite ends, connected to the arm at one of said ends;

a sway bar pivotally mounted on the main frame adjacent the forward end section;

the outer end of the pitman being connected to the sway bar to alternately pivot the sway bar about the pivot thereof upon rotation of the drive shaft; and

chains extending from the ends of the sway bar to spaced locations on the rings whereby alternate pivoting motion of the sway bar is transmitted to the rings.

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